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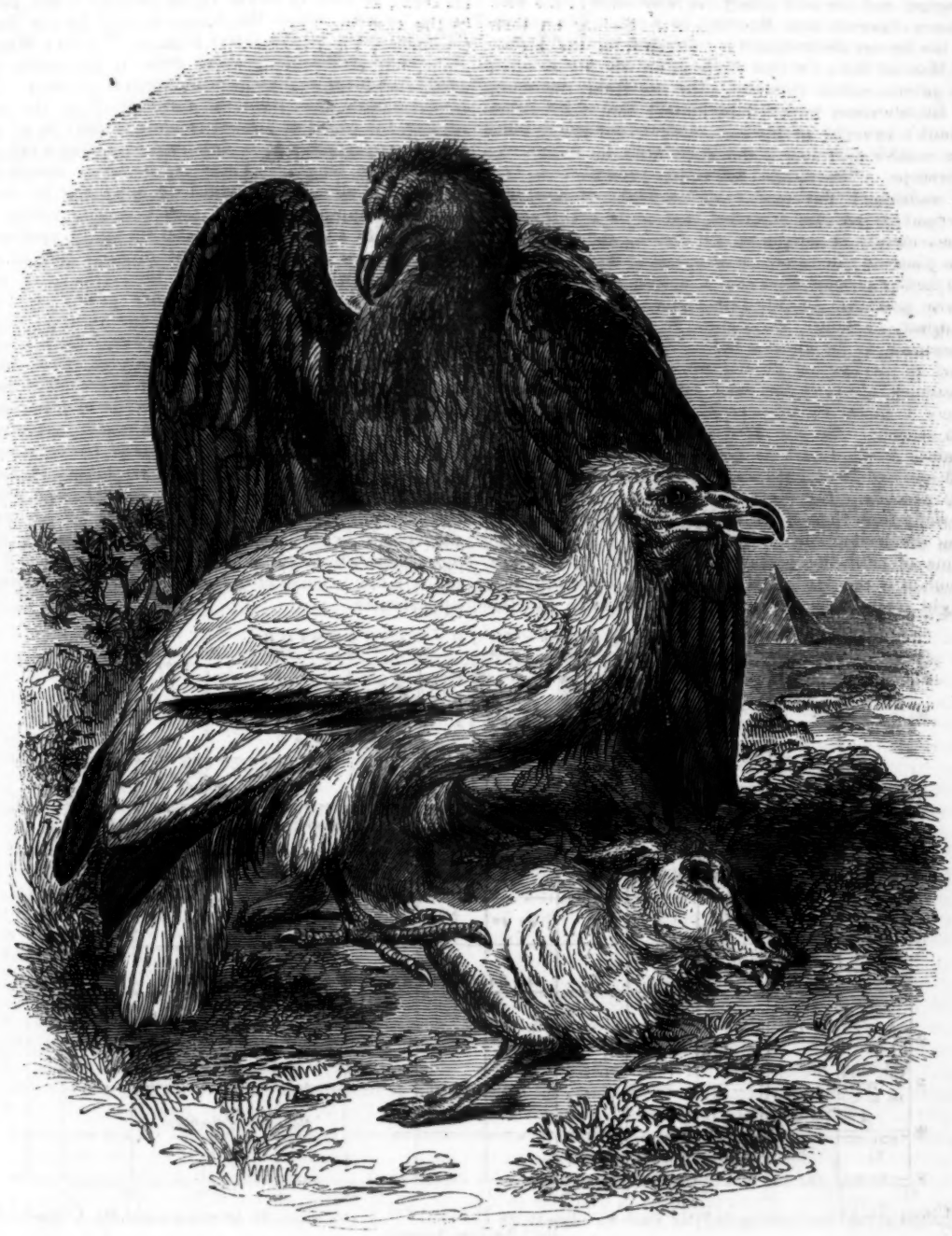
THE EGYPTIAN VULTURE, OR PHARAOH'S CHICKEN.



[Egyptian Vultures.]

ALTHOUGH the parallels which, in the present day, some distinguished naturalists have attempted to draw between *mammalia* and *birds* are for the most part overstrained and visionary, there are certainly some instances in which they are truly indicated by Nature. This analogy is perhaps in no instance better established than between the vultures and the hyæna, jackal, or wolf. Alike scavengers of the earth, they

clear it of its dead, they remove its offal,—its noisome *rejectamenta*, which would otherwise corrupt the air with pestilential exhalations. The vultures, however, have far less ferocity in their disposition than the analogous quadrupeds. The latter attack living prey with great ferocity and strong appetite for blood, whilst the former exclusively gorge upon the carcasses of the dead, and never make the living their victims. Happily for them, they are seldom at a loss for a meal in the countries where they abound. The unburied slain on the field of battle attract them in flocks from a great distance;—the death of any beast in the field calls an assembly to the banquet. Sailing on their wide and ample wings, they sweep from the higher regions of the air to their repast, on which they often gorge themselves till unable to rise from the spot. It is only when impelled by hunger that the vulture proceeds in quest of his carrion-food, and rouses from his apathy to traverse the air. Mounting aloft till almost out of sight, he skims in large circles, sustained on outspread but motionless pinions, scanning the surface of the earth. Often, indeed, the sky seems quite clear, and not the least trace of any bird can be discovered by the eye;—but no sooner does an animal fall,—or no sooner has the hunter slain or abandoned his quarry,—than, as if called at once into existence, multitudes of vultures seem pouring from the sky, and flocking to the feast.

Is it by the powers of sight or of smell that these birds, afar off in the air above, or on the very verge of the horizon, are thus led to their booty? This is a question not yet settled. The ancient classic writers teem with passages attributing to the vulture a keen and discriminating scent; and certainly the development of the organs of this sense would seem to favour the opinion, which is supported by Mr. Waterton and others, but which Mr. Audubon considers to be erroneous. This latter observer of Nature maintains that it is by the extraordinary powers of sight that the vulture perceives his prey, and Le Vaillant explains the circumstance upon the same theory. "Desirous," he says, "of observing how so great a number of vultures could congregate together in so short a space of time, I concealed myself one day in a thicket, after having killed a large gazelle, which I left upon the spot. In an instant a number of ravens made their appearance, fluttering about the animal, and making a great croaking. In less than a quarter of an hour these birds were reinforced by the arrival of kites and buzzards; and immediately afterwards I perceived, on raising my head, a flight of birds at a prodigious height, wheeling round and round in their descent. These I soon recognised to be vultures, which seemed, if I may so express myself, to escape from a cavern in the sky. The first comers fell immediately upon the gazelle, but I did not allow them time to tear it in pieces. I left my concealment, and they betook themselves slowly and heavily to flight, rejoining their comrades, whose numbers seemed to increase. They seemed almost to precipitate themselves from the clouds to share the spoil, but my presence caused them speedily to disappear. Thus it is, then, that the vultures are called upon to participate in their prey:—the first carnivorous birds that discover a carcass rouse the others which may happen to be in the environs by their cries and by their motions. If the nearest vulture does not spy his prey from the lofty region of the air in which he swims by means of his wide-spread wings, he perceives at least the subaltern and more terrestrial birds of prey preparing to take possession of it; but perhaps he has himself a sufficient power of vision to enable him to discover it. He descends hastily and with a wheeling flight, and his fall directs the other vultures who witness his evolutions, and who no doubt have their instinct sharpened with regard to everything that concerns their food. A concourse of carnivorous birds speedily takes place in the neighbourhood of the carcass sufficient to attract the vultures of the whole district, nearly in the same manner as the disturbance created by a number of men running along the streets of a crowded town attracts the whole population to follow in their train."

Notwithstanding all this, and the experiments of Mr. Audubon, we do not think the conclusion by any means demonstrated, that the vulture is not guided by his scent, as well as by his powers of vision, according as the case may be. The great family of vultures (*vulturidæ*, Vig.) is extensively spread throughout the globe, but especially abounds in the hotter latitudes, where their utility in removing carrion and all putrid animal substances, from the fields, the villages, and even the towns, has been universally acknowledged. As we recede from the hotter climes to the more temperate regions, we gradually lose the presence of the vultures, till at length the boundaries of the race are passed. Their extreme boundaries, however, are more northerly, or rather are carried out more nearly to the higher latitudes of the globe than might at first be suspected. In America the turkey vulture (*cathartes aura*) ranges from Terra del Fuego to Nova Scotia, and the black vulture (*cathartes atratus*) is common in Carolina. Species are found in southern and central Europe, without reckoning the lammer-geyer (*gypætos barbatus*) which forms a connecting link between the timid, indolent, and gluttonous vultures on the one hand, and the fierce, rapacious eagles on the other, we may enumerate the *vultur cinereus* and the griffon, or *vultur fulvus*, both of which occur in the mountain chains of even central Europe, and are tolerably common in the southern districts, being spread over most parts of the old world. To these we may add the remarkable bird of which we give a figure, and which is very common in Spain, viz., the Egyptian vulture, or Pharaoh's chicken (*neophron percnopterus*).

The genus *neophron* may be regarded as equivalent in the Old World to *cathartes* in the New, the Egyptian vulture closely approximating in form, habits, and relatively in the range of its habitat to the turkey vulture so ably described by Wilson and Audubon. Of the vultures of the Old World the Egyptian vulture is the smallest; it is however one of the most numerous, and especially abounds in Egypt and the adjacent provinces of Europe, Asia, and Africa; it has even been seen in Italy and Switzerland, and has once been killed in England. This circumstance occurred in 1825, at Klive, in Somersetshire; the specimen was that of an immature bird, probably not more than a year old: it was accompanied by a second individual, which was too wary to allow itself to be approached within gunshot. In Egypt the utility of these vultures in clearing the streets of filth of every description (a task which they undertake in common with the pariah dogs) has been frequently noticed. Nor were the services of this bird less valued in ancient than in modern times; it was among the number of the sacred animals, and is often represented pretty accurately on the early monuments of Egypt. Hence its appellation of Pharaoh's chicken. A constant attendant on the caravan, as it pursues its way from town to town,—an assiduous frequenter of the shambles,—an industrious searcher for carrion, it merits, as far at least as its public utility is concerned, the regards of the community; nor are its services overlooked,—if not now adored as a deity, it is at least esteemed as a benefactor. In the neighbourhood of Gibraltar, and in the south of Spain generally, flocks of this vulture are annually seen: most probably they winter in Africa, but of this we have no decided information. Capt. S. E. Cook says that he saw them,

near Seville, following the track of the plough, like rooks, in order to devour the grubs in the upturned soil.

The long and ample wings of the Egyptian vulture give it amazing powers of flight, and enable it to soar with great buoyancy. Like the rest of the family, however, when gorged to repletion with its foul diet, it becomes so sluggish and unwieldy as scarcely to be able to raise itself from the ground, and indeed in this state may be easily captured; not that the task would be very pleasant, so strong and disgusting is the effluvium which it emits.

Bruce considers this bird to be the rachamah of Scripture, (see the appendix to his Travels,) such being the name by which it is now known in Egypt.

In size the Egyptian vulture somewhat exceeds a raven, its length being two feet five or six inches, and the expanse of its wings about five feet eight or nine inches. When in complete plumage, it is of an uniform white, with the exception of the greater quill feathers, which are black. The forehead, cheeks, and throat are naked, the skin being of a livid yellow. The eyes are dark. The bill is slender and straight,—abruptly hooked at the tip. This state of plumage is acquired by successive changes, the first lining being umber-brown, which is gradually exchanged, at each moult, for lighter and lighter tints till the purity of the white is complete. It breeds in the clefts of rocks, and on elevated places, but its eggs have never been described.

CHINA.—No. IV.

The Canals of China.

Even the wonders of the great wall of China are surpassed by the innumerable and long canals, the utility of which is less a matter of doubt than the artificial boundary which has been so often set at nought by invaders.

Availing themselves of the great number of rivers and lakes that exist in their country, the industrious Chinese have almost everywhere opened communications by water, and for this purpose, and for the object of irrigation, have dug so many canals that much of China is like a vaster Holland. The traveller finds almost everywhere a large canal of fine, deep, clear water, flanked by two causeways, cased with flat stones or marble slabs, set in the ground and fastened by groves made in posts or columns of the same materials. From this main canal there shoot off, at certain distances, numbers of smaller canals, the waters of which are again let off into innumerable rivulets that are conducted to different large towns, or employed to irrigate the country. Besides these they have an infinite number of reservoirs and channels by which they can lay the fields under water, to produce rice, their principal food, and which requires almost constant humidity.

But nothing in China or in any other part of the world is to be compared with the Yun Leang, or Royal Canal, which is 300 leagues in length*. It was dug by an almost incredible multitude of men, and at a most prodigious expense, under the Emperor Chi-tsou, (about the year 1280,) the founder of the dynasty of the Western Tartars. "This canal," says Du Halde, "traverses the provinces of Pe-tche-li and Chan-tong; then it enters the province of Kiang-nan, and discharges itself into the great and rapid Yellow River. Down this river you sail for two days, when you come to another river, where you find again the canal, which leads to the city of Hoai-ngan; from thence it passes by many cities and large towns, and arrives at the city of Yang-tcheou, one of the most famous ports of the empire; and a little beyond this place it enters the great river Yang-tse Kiang, which divides the province of Kiang-si nearly into two equal parts, and runs as far as Nan-ngan, from whence you go by land to Nan-hiong, the chief city of the province of Quang-tong, where you embark upon a river that leads to Canton, so that you may travel very commodiously, upon the rivers or canals, from the capital to the remotest part of China, being about 600 leagues, by water."

In 'Purchas's Pilgrims,' this extensive canal is styled "a hand-made river," and is described with his usual quaintness and effect. "This worke is goodly and wonderfull for the site and length, and more for the profit thereby to the cities. There are also causies made to goe on land by those waters commodiously," &c. Mr. Barrow, in his Travels in China, gives, in a few words, a general idea of the principles on which this grand undertaking was carried on:—"All the rivers of China fall from the high lands of Tartary, which lie to the northward of Thibet, crossing the plains of this empire in their descent to the sea from west to east. The inland navigation being carried from north to south, cuts these rivers at right angles, the smaller streams of which terminating in it afford a constant supply of water; and the three great rivers intersecting the canal carry off the superfluous water to the sea. The former, therefore, are the feeders, and the latter the dischargers, of the great trunk of the canal. A number of difficulties must have arisen in accommodating the general level of the canal to the several levels of the feeding streams; for notwithstanding all the favourable circumstances of the face of the country, it has been found necessary in many places to cut down to the depth of sixty or seventy feet below the surface; and in others, to raise mounds of earth upon lakes and swamps and marshy grounds of such a length and magnitude that nothing short of the absolute command over multitudes could have accomplished an undertaking whose immensity is only exceeded by the great wall. These gigantic embankments are sometimes carried through lakes of several miles in diameter, between which the water is forced up to a height considerably above that of the lake; and in such situations we sometimes observed this enormous aqueduct gliding along at the rate of three miles an hour."

Constant labour and the most unremitting attention are employed for the preservation of this magnificent canal; it is constantly visited by inspectors, and hosts of workmen are stationed along it to repair any damage the moment it happens. When the water rises too high, sluices are opened which convey the superfluity into small canals without inundating the country, and keep the stream in the main channel to its proper elevation, which allows a depth of a fathom and a half, quite sufficient for the vessels that navigate it.

A canal of such length must of necessity be furnished with locks, or something equivalent to them; and here it is curious to compare the contrivance of the Chinese with our own.

"I have myself," says Father Kircher, "counted upon the grand canal above twenty cataracts or waterfalls, made of hewn stone, firm and nobly artificial, with a passage for ships, where they dam up the waters with a sluice, which is easily heaved up by benefit of an engine with a wheel, affording an outlet to the waters, and a passage to the ships; and if they want water for great vessels, then in the middle passage, before you come to Cining, they let in from the lake Cang, through the greatest cataract, as much as they please, timely closing the passage to prevent an inundation. These cataracts are commonly called Tung-pa, because they sustain the force of water flowing from

* "I may safely say that, in point of magnitude, our most extensive inland navigation of England can no more be compared to this grand trunk that intersects China than a park or garden fish-pond to the great lake of Winandermere."—Barrow.

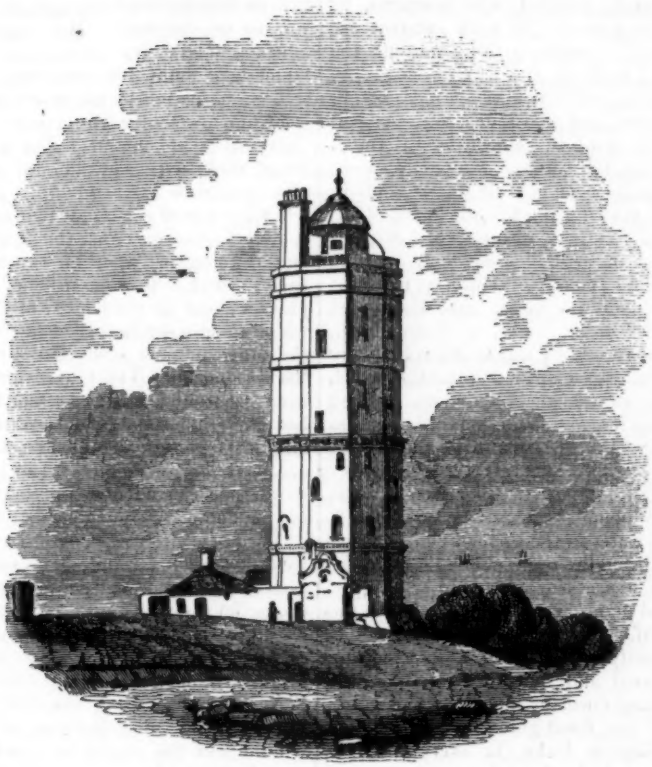
the lake: now when ships arrive, that they may not be forced to sail through the lake, they have cut a trench or channel on the bank, fortified with ramparts, by which all ships do easily pass. At each cataract are persons maintained at the public charge, to attend the ships until they have passed the cataract."

This method, however, could not be adopted, owing to the great difference in their elevations, and the inequality of the soil in many of the canals. Between Yang-fou and Tchu-san, for example, where two canals meet, the difference in the level of their waters is above six feet. To pass the vessels from the one to the other, the most simple plan has been resorted to. A glacis or an inclined plane, at an angle of about forty degrees, built with stone and kept smooth or slippery, raises at the end of the canal, and the vessel that has to pass from the lower to the upper water, is dragged up, having cables attached to her, by means of two or more (sometimes as many as six) enormous capstans, which are placed by the sides of the canals above the inclined plane. Each windlass has four bars, manned by from twelve to sixteen men. Having once made the ascent, the vessel descends by the force of gravity into the upper canal by means of another but shorter inclined plane, the apex of the two planes being always somewhat above the level of the water in the upper canal. When the vessel has to pass from the upper to the lower canal, the labour is of course less, as she has only to be dragged up the shorter inclined plane, when she glides down the longer one of herself. According to Dr. Dinwiddie, who had an opportunity of examining more at leisure both the common canal and the other canals whose communication is maintained by means of this *glacis* or inclined plane, "the flood-gates of the Chinese are preferable to English locks, in every situation where the canal is nearly level, and are constructed at a quarter of the expense. The inclined plane down which the boats are launched, and up which they are drawn, is a mode superior to our practise, for besides their being cheaper they are much more expeditious. The time employed in one instance observed, was only 2½ minutes, in another about 3 minutes."

In every account of China the description of the Grand Canal forms a prominent feature. "This magnificent work," says Marco Polo, whose descriptions here, as in so many other instances, have been confirmed by modern and most authentic authorities, "is deserving of all admiration, and not so much from the manner in which it is conducted through the country, or its vast extent, as from its utility and the benefit it produces to those cities which lie in its course. On its banks, likewise, are constructed strong and wide terraces, or *chaussées*, upon which the travelling by land also is rendered perfectly convenient." This was written in the thirteenth century, and perfectly agrees with the account we have already given. "It is an inland navigation of such extent and magnitude," says Mr. Barrow, "as to stand unrivalled in the history of the world." "There are no undertakings of utility and invention for which the Chinese are more celebrated than for these wonderful communications by water through the interior of their vast empire,"—says Lord Macartney. "These have excited general admiration among foreigners. As a considerable part of our journey was upon what is usually called the Grand or Imperial Canal, I am enabled to give some account of it. This great work was executed for the purpose of laying open to each other the northern and southern provinces of the empire. It is more properly an improved river than an entirely artificial canal, according to our general acceptation of the term, for it has a descent almost in every part, and generally runs with a considerable velocity." His lordship then goes on to describe how the Chinese, who he supposes to be ignorant of the principles of levelling, had sagacity to avail themselves of every natural advantage offered by the elevation or depression of the ground over which the water was to be conveyed. He traces the communication between the rivers Eu-ho and Hoang-ho, which is made by a canal 200 miles long, and in this manner. "The beds of these two rivers are nearly on the same level, but the interjacent country rises from each of the rivers with an imperceptible ascent, and is highest about mid-way. The Chinese had no instrument or other means of art to ascertain this point of elevation, but nature seems to have indicated it to them by the course of another river, which, rising to the eastward, and running westward in the intermediate space between the Eu-ho and Hoang-ho, is obstructed in its passage, and then divides into two branches, one of which takes a northern course and falls into the Eu-ho, the other pursues a southern route and descends into the Hoang-ho. The northern stream seems to have been generally traced according to all its windings, the bed of it enlarged, and formed with a uniform descent, and its navigation improved by flood gates thrown across at certain distances, sometimes of two, three, or more miles asunder, in order to prevent too great or too sudden a loss of water."

Lord Macartney then describes the flood-gates, which we have already noticed. They only consist of a few loose planks, sliding between two grooves, cut in the stone piers or abutments, which project on each side from the banks of the canal, and approach so near, as to leave in the middle only a sufficient space for the passage of the largest sized junk. His Lordship then proceeds:—"A few miles before the northern branch joins the Eu-ho, instead of following, as formerly, the natural windings of the stream, it is carried straight forward in one direction, by a deep cut of forty feet through a partial elevation of the surface of the ground. The task was not difficult, as the soil is a mixture of light sand and clay, entirely free from rocks or any sort of stone. But the southern branch required more management and address, as its progress was to be directed over a great extent of swampy grounds and lakes, and from thence through an ascending country to the Hoang-ho. On approaching this morass, they were obliged to cut very deep below the surface of the ground, for the purpose of giving the water a velocity sufficient to force itself between two high banks raised above the inundated country with incredible labour and expense. In one place it traverses a vast lake, whose surface is far below its own, and there its banks are rivetted with enormous blocks of marble, clasped together at the top with iron; and lest the body of water in the canal should prove too strong for the resistance of the banks, they are intersected with sluices at certain distances, through which the superfluous water passes into deep ditches or hollows formed on each side in the middle of the banks themselves. The surface of the water let into these ditches or hollows being kept at a mean height between the surfaces of the canal and the lake, the pressure of the body of water is diminished by one-half, and the danger of disruption proportionately diminished. The canal then proceeds through a rising country, being often thirty and forty feet below the surface of the ground, and falls into the Hoang-ho with a current of two to three miles per hour. From this account it may be inferred that the Chinese in flat or nearly flat countries, are chiefly directed by the apparent course of the natural streams, follow it as nearly as possible, without regarding the labour or expense attending such a system, and when they come to a difficulty not easily surmounted by their other means, they have recourse to a *glacis*, up and down which the vessels are passed between two canals of different levels."

NORTH FORELAND LIGHTHOUSE.



[North Foreland Lighthouse. Aug. 18, 1834.]

The North Foreland is a promontory in the Isle of Thanet, and is so called to distinguish it from another promontory called the "South Foreland," between Deal and Dover. It was well known to the Roman seamen under the name of Cantium Promontorium. The lighthouse, which has long stood on this point, is not a very picturesque or striking object; but as the dangerous neighbourhood of the Godwin Sands, which lie off the promontory, renders it one of the most useful of our lighthouses, and as, from its situation near the mouth of the Thames, it is better known to a greater number of persons than any other, we present an engraving of it to our readers.

A full account of the Eddystone Lighthouse, with engravings, has been given in a former Number of the 'Penny Magazine.' The history of the present structure is not without interest, but its interest is of a different kind from that of the former, arising almost entirely from the intimations it contains of the improvements gradually introduced in the mode of effecting the object for which it was established.

The necessity for a lighthouse at this place must have become apparent when the Godwin Sands became dangerous, and when it was found that in directing their course so as to keep clear of this land, which extends so far into the sea, ships were extremely liable to strike on the sands at night before they were aware. There was probably some sort of a beacon at an earlier period, but the first distinct intimation concerning a lighthouse on the North Foreland is in the year 1636, when Charles I., by letters-patent, granted to Sir John Meldrum licence to continue and renew the lighthouses then by him erected on the North and South Forelands. It seems that the lighthouse erected by Sir John consisted merely of a house, built with timber, lath, and plaster, on the top of which a light was kept in a large glass lantern, for the purpose of directing ships in their course. This house was burnt down by accident in the year 1683; after which, for some years, use was made of a sort of beacon on which a light was hoisted. But near the end of the same century a strong octagonal structure of flint was erected, on the top of which was an iron grate quite open to the air, in which a good fire of coals was kept blazing at night.

About the year 1732 the top of this lighthouse was covered with a sort of lantern, with large sash windows, and the fire was kept bright by bellows, with which the attendants blew throughout the night. This contrivance is said to have been for the purpose of saving coals; but it would seem more probable that it was in order to preserve the fire from being extinguished by rain. However the plan did not work well, and great injury resulted to navigation, as many vessels were lost on the sands from not seeing the light, and so little was it visible at sea, that mariners asserted that they had often in hazy weather seen the Foreland before they could discover the light. They added, that before the lantern was placed there, and when the fire was kept in the open air, the wind kept the fire in a constant blaze, which was seen in the air far above the lighthouse.

Complaints of this sort were so loud and frequent, that the governors of Greenwich Hospital, to whom the lighthouse belonged, sent Sir John Thomson to examine and make arrangements on the subject. He ordered the lantern to be taken away, and things to be restored to nearly their former state, the light to continue burning all the night until daylight.

Towards the end of the last century the North Fore-

land Lighthouse underwent some considerable alterations and repairs, which brought it into nearly its present state. Two stories of brick were built on the original structure, which raised it to the height of about 100 feet, including the room at the top in which the lights are kept. This room, which may be described as a dome raised upon a decagon, is about ten feet in diameter and twelve in height. To prevent accidents from fire, it is coated with copper, as is also the gallery around it. This gallery is much frequented by the visiters to Margate on account of the extensive views which it commands, some idea of which may be formed from the fact that the lights are visible in clear weather at the Nore, which is thirty miles distant. The building is white-washed, except the light-room at the top, and the several other rooms which it contains are occupied by the persons who have it under their charge.

The two sides of the decagon towards the land are walled up; but at the time of the above alterations the coal-fire was discontinued, and in each of the other faces of the decagon was placed a patent lamp with a reflector and a magnifying lens. These lenses were twenty inches in diameter, and cost 50*l.* each, and were recommended as curiosities to the notice of visiters in the 'Margate Guides.' These, however, seem to be the same lenses which are mentioned with great disapprobation by Lieutenant Drummond in his evidence before the Committee of the House of Commons, in April, 1834. Having previously stated incidentally that he thought it not improbable that a vessel might run against the lighthouse without seeing the light, and that he had been informed that such an event had occurred, he was requested by the Committee to explain this matter more particularly. He then said:—"It is a mode of lighting which has been discontinued in this country. About three years ago I saw it in the North Foreland Lighthouse, then under the management of Greenwich Hospital. The mode there adopted was a combination of the lens with the reflector; a lens not similar to the French, but consisting of one solid piece of glass, very thick and very bad. The result of this arrangement was entirely to destroy the effect of the reflector; and in fact, it was absolutely putting a shade before a good light. In ordinary cases a window of the lantern is of thick clear plate-glass; but here, instead of the plate-glass, they put a lens in front of each, which destroyed the parallelism of the beam of light from the reflector and entirely injured its effect. The reflector, it is true, did not interfere with the lens; but from the thickness and badness of the glass, and other causes of an optical nature, the effect of the lens was far inferior to that of the reflector when unobstructed by the lens." When the Trinity House, soon after this, acquired the management of the lighthouse, these costly lenses were immediately removed, and plate-glass was substituted, in consequence of which the light, though otherwise unaltered, appears much more brilliant than before.

The grant of Sir John Meldrum, who originally established the lighthouse in the North Foreland, was for fifty years, during which he was empowered to demand 1*d.* per ton on all British ships that passed the lighthouses, and 2*d.* per ton on all foreign ships, paying to the crown a reserved rent of 20*l.* a year. This grant was renewed from time to time to private persons, the last of whom, Mr. Osbolston, bequeathed by will the remainder of his interest to Greenwich Hospital. When this remainder expired in 1733, the crown renewed the grant to the Hospital for ninety-nine years, on the termination of which in 1832 the lighthouses were transferred to the Elder Brothers of the Trinity House, who agreed to give 8366*l.* in compensation to the Hospital, and at the same time to reduce the dues in future to ¼*d.* per ton on British ships, and ½*d.* per ton on foreign vessels.

At the time of the grant to Greenwich Hospital in 1733, the Foreland lighthouses yielded together about 1200*l.* per annum, and in some years 1400*l.* In 1831, the dues remaining the same, the gross receipts of the lighthouses amounted to 12,010*l.*, an increase which affords a curious incidental illustration of the extension of maritime commerce within the last hundred years. Of this sum 2124*l.* was expended in collecting the dues and maintaining the lighthouses, and 20*l.* was paid as rent to the crown, leaving 9866*l.* profit to the Hospital. The Trinity Board calculates that under the diminished dues its gross receipts from the lighthouses will amount to 2350*l.*, leaving, after all expenses, 900*l.* to compensate the Board for the outlay of capital; the resulting profit being for the benefit of merchant seamen.

To these particulars concerning the North Foreland Lighthouse we may add a few general remarks concerning the management and revenues of such establishments in this country. There are ample statements on this subject in the Report which was delivered last year by the Select Committee of the House of Commons appointed to inquire into the state and management of Lighthouses. From this bulky mass of documents we collect that the shipping interest has been made to pay dearly for the convenience and security which the lighthouses afford; and we find abundant matter to justify the bitter complaints which a person who takes a passage by sea is sure to hear from his captain on the subject, particularly if that captain happens to be the owner of the vessel. A few simple statements will make this matter clear to our readers. The Committee says:—

"Your Committee has learned with some surprise that the lighthouse establishments have been conducted in the several parts of the United Kingdom under entirely different systems; different as regards the constitution of the board of management, different as regards the rates or amount of the light dues, and different in the principle on which they are levied. They have found that these establishments, of such importance to the extensive naval and commercial interests of this kingdom, instead of being conducted under the immediate superintendence of the government, upon one uniform system, and under responsible servants, with proper foresight to provide for the safety of the shipping in the most efficient manner, and on the most economical plans, have been left to spring up as it were by slow degrees, as the local wants required, often after disastrous losses at sea; and it may perhaps be considered as a matter of reproach to this great country, that for ages past, as well as at the present time, a considerable portion of the establishments of lighthouses have been the means of heavily taxing the trade of the country, for the benefit of a few private individuals, who have been favoured with that advantage by the ministers and the sovereign of the day."

The subjoined table, which condenses the statistics of this subject, will render clear the preceding and following observations. It shows the number of the public lighthouses maintained in the United Kingdom, the amount of light dues received, the sums expended, and the net surplus in 1832.

No. of Lights.	By whom held.	Gross Collection.	Charges of Collection.	Expense of Maintenance.	Net Surplus.
55	By Trinity House, London	83,041	6,670	35,904	40,467
14	By Private Individuals	79,676	10,244	9,109	60,322
25	By Commissioners of Northern Lights, Scotland	35,526	3,261	11,314	20,951
40	By Commissioners of Ballast Board, Ireland	42,061	1,960	18,505	21,596
134		240,304	22,135	74,832	142,436

This account leaves the local harbour-lights out of view, and, as to the number of lighthouses, somewhat

differs from another, which states that there are in all 219 lights in the United Kingdom; namely, 105 public general lights on land, and 17 floating lights; 93 local or harbour-lights on land, and 4 floating lights. In particular reference to the facts which the above abstract of our lighthouse-statistics exhibits, the 'Edinburgh Review,' which had an article on this subject in its April Number, thus states the results which it affords:—"1. The enormous sum of 240,304*l.* is annually levied from the shipping interest of Great Britain and placed at the disposal of irresponsible boards, or used for the benefit of private individuals. 2. The annual sum *actually applied* to the purpose for which the whole sum is levied is only 74,832*l.* 3. The net surplus, or the sum *unnecessarily levied*, amounts to 142,436*l.* 4. The expense of collection, amounting to 22,135*l.*, is little less than one-third of the expense of maintaining all the lights in this kingdom, and is twice the expense of maintaining all the French light-houses."

It is to be borne in mind that this large sum unnecessarily levied for light-dues is not a matter merely affecting the masters and crews of vessels, or indeed the shipping-interest at all. It is a question in which the public at large are interested, because those who pay the sum in the first instance necessarily indemnify themselves by raising in proportion the price to the purchaser of the articles with which the vessels are laden. The lighthouse-dues are therefore, as the 'Edinburgh Review' remarks, "paid by every consumer of foreign and domestic produce carried coastwise;—every child that sucks an orange, and every dandy that smokes a cigar, is a contributor to the lighthouse-revenues as well as to that of the customs."

The dues are particularly heavy upon every foreign vessel, from which a double rate is required; and it is thus taxed not only when it proceeds with goods or money to our harbours and returns laden with our produce and manufactures, but "it is equally taxed when, on its way to more distant kingdoms, it is driven by stress of weather into the shelter of our bays and headlands, and the captain is called to pay a heavy penalty for attempting to save the property of his employers and the lives of his shipmates. The same absurd and cruel regulation is applicable also to British vessels; and there can be no doubt that ships and lives are frequently lost in their attempts to shun the *Scylla* of the lighthouses while they are escaping from the *Charybdis* of the elements*."

The mere pecuniary pressure of the light dues is, however, by no means the only evil of the system now in operation. The number of boards and individuals by whom the lighthouses are held, and who have no mutual understanding among themselves, and have no determined rules for their guidance, occasions the most vexatious and perplexing inequality of dues and discordance of legislation. Even the pressure of the same dues now operates unequally, as between sailing and steam-vessels. This matter is thus noticed by the committee:—

"The present rates are made without reference to the peculiarities attending on the navigation of that class of vessels (steamers) which appear to warrant a reduction of the dues. A vessel under sail is driven by winds and tides that lie in her course, and, in tacking, derives much benefit from the lights; but steamers move in straight lines, and perform much of their voyage in the day time: they see few lights, and, by the rapidity of their movements, soon pass them. Besides, the people who navigate them acquire, from the frequency of their trips, such an intimate acquaintance with the coast as renders the lights of comparatively little use to them. Again, steamers are obliged generally to sail at fixed times, full or not full; and the carrying tonnage of a steamer is not so capacious as that of another vessel, the best part of the hold being occupied by machinery. By the return of the voyages of fifteen steam vessels, between the River Clyde and Liverpool, Belfast, Dublin, and Londonderry, in one year (1833), there was paid for light dues 3261*l.*, a very heavy charge on such vessels; and many similar instances might, if necessary, be stated."

The system, the principal features of which we have attempted to delineate, is censured in the strongest terms by the committee of the House of Commons. The remedial measures which they suggest are principally the following:—That all the public general lighthouses should be placed under one board resident in London, and conducted under one system of management. That the light dues should in every case be reduced to the smallest sums requisite to maintain the existing lighthouses and floating lights, or to establish such new ones as may be required. The committee had considered whether the lighthouses might not be maintained out of the public treasury, in the same way as the consular charges are defrayed; and also whether it might not be better to levy a tonnage duty on ships entering our ports, whether British or foreign, once every six months, or yearly, instead of on every voyage as at present; but they decline to give an opinion on either of these plans. They recommend that the double duty on foreign vessels should be removed, and that vessels driven into port by stress of weather should not be obliged to pay the light dues, if they do not break bulk or take in cargo at such port. It is also their opinion that, in the peculiar circumstances of steam-vessels, there ought to be a modification of the dues at present levied upon them.

* 'Edinburgh Review.'

MINERAL KINGDOM.—Section XLIV.

Zinc.

This metal was first described under the name of *Zinctum* by the celebrated alchemist Paracelsus, a native of the canton of Schweiz, who lived in the early part of the sixteenth century; but it was probably known long before, for it enters into the composition of some kinds of ancient brass. The name is supposed by Leonhard to be of German origin, and to have been a miner's term, from the word *Zinke*, which signifies a sharp point or pinnacle, the metal assuming, in the furnace, a toothed or jagged appearance, from shooting into crystalline forms. In England it is known in commerce by the name of *Spelter*.

When pure, zinc is of a bluish-white colour, with a bright metallic lustre, but it is speedily tarnished by the air. It is of a low specific gravity, viz.. 7·10, that is, about seven times as heavy as an equal bulk of water. It is very brittle at ordinary temperatures, but when heated to that of boiling water, or 212°, it becomes malleable, and may be beat or rolled out into tolerably thin plates; and that property continues until the heat goes beyond 300°, when it again becomes brittle, and if it be raised to about 400°, it may be easily reduced to powder. It must be heated also in order to show its property of ductility; but if the wire be properly annealed, it retains, when cold, a considerable degree of tenacity,—a wire of one-tenth of an inch in diameter supporting a weight of 26 lbs. It melts at a heat equal to 773° of Fahrenheit: by a moderate increase of temperature, it is volatilized unchanged in close vessels, but exposed to the air it forms a white oxide called flowers of zinc; and if the heat be raised to 941°, it burns with a brilliant white light: it is little altered by exposure to air and moisture.

Zinc has never been found in the pure or native

state, but always in combination with oxygen, carbonic acid, sulphur, water, earthy and other metallic bodies; but there are not many varieties of its ores. The most commonly met with are those called *Calamine* and *Blende*. Calamine (the *Lapis Calaminaris* of old medical books) is a compound of about 65 per cent. of oxide of zinc and 35 of carbonic acid; and some varieties of it are composed of 72 of oxide of zinc, 13 of carbonic acid, and 15 of water. Blende, called by the English miners "*Black Jack*," is a compound of zinc and sulphur; the proportions of the zinc and sulphur varying much in the ore of different situations, and almost all of them contain a portion of iron, earthy matter, and water. Blende is found in the primary and in the older of the secondary stratified rocks, and very frequently accompanies ores of lead and copper, but especially the former. Calamine is more commonly met with in the secondary strata, and principally in limestone. The ores of zinc have not hitherto been found in the igneous or unstratified rocks, and only sparingly in the sedimentary deposits superior to the coal-strata. They are met with in Germany, Belgium, France, and Sweden; and in Great Britain, in Cornwall, especially in Huel Hope mine, in the parish of Gwennap; in a conglomerate or puddingstone-rock of the Mendip Hills in Somersetshire; abundantly in the limestone of Derbyshire, where the lead-mines are situated; and associated with the lead-ore at Holywell in Flintshire; at Aldstone Moor in Cumberland; and at Wanlock Head and Lead-Hills on the borders of the counties of Dumfries and Lanark. But all the zinc that is now produced in the United Kingdom is trifling in quantity, and quite insufficient for the demand, so that a large amount is imported annually, chiefly from Germany and Belgium. In the year 1833 the importation was 65,115 cwts., of which rather more than a half was retained for home consumption, the chief export being to the East Indies.

To obtain the metal, the ore, whether it be calamine or blende, after being raised from the mine, is carefully picked, to separate any impurities, and roasted in a furnace in a moderately red heat, by which the carbonic acid is driven off from the calamine and the sulphur from the blende. An oxide of zinc remains, and this is intimately mixed with powdered coal by their being ground together in a mill. The mixture is now put into large earthen crucibles, about four feet high, having an iron tube in the interior, one end of which rises near to the top, the other passing through the bottom of the jar and the floor of the furnace into a cistern of water underneath. Covers are firmly luted to the crucibles; they are surrounded with fuel in the furnace, and an intense heat is kept up for several hours. The carbon of the coal combines with the oxygen of the ore; and the metallic zinc, thus set free, rises in a melted state to the top of the crucible, descends through the iron tube, and is condensed in the water in the form of drops. These drops, being collected, are again melted, and poured into moulds to form the bars or ingots in which the metal is brought to market. Eight tons of calamine and twenty-two tons of coal yield about two tons of zinc.

Uses of Zinc.—The chief consumption of this metal is in making brass, which is a compound of copper and zinc. The ores, after undergoing the process of roasting near the mines in England, are chiefly smelted in the neighbourhood of Birmingham, Sheffield, and Bristol, where there are large manufactories of brass. The proportions of the two metals are very different in the brass made in different places. The common brass of Paris contains about 13 per cent. of zinc, that of England rather more; and a remarkably fine brass made at Geneva for the nicer parts of watchmaking contains as much as 25 per cent. The brass of England is far inferior to that made in many parts of the continent, and that used for philosophical instruments is chiefly obtained from Holland. Zinc, rolled out into sheets, has been used for covering houses instead of lead, and it has of late been manufactured into vessels for culinary and other domestic purposes. It is very unsuitable, however, for kitchen-utensils, because it combines very readily with acids, and such combinations act as violent emetics. Zinc is used in China for coins. United with oxygen it forms a white powder, which is used in oil-painting. White vitriol, a substance employed in many processes of art, and in medicine, is a compound of zinc and sulphuric acid.

Preambles.—Some will preamble a tale impertinently, and cannot be delivered of a jest till they have travelled [travailled] an hour in trivials; as if they had taken the whole tale in stenography, and now were putting it out at large.—*Owen Feltham's Resolves.*

Regulation of Expenses.—In expenses I would be neither pinching nor prodigal; yet, if my means allow it not, rather thought too sparing than a little profuse. Saving inclines to judgment, but lavish expenses to levity and inconsiderateness. With the wise 'tis no disgrace to make a man's ability his compass of sail and line to walk by; and to exceed it, for them that are not wise, is to be sure to exceed them as well in folly as expense. He is equally ridiculous that will burn out his taper while the sun doth shine, as he that will go to bed in the dark to save his expense of light. It is my part to know what I may do, while others look only at the stream, but are not concerned how the fountain may supply it. Though the look to what I spend is grateful to them, yet I ought to care for what is convenient for me. He that spends to his proportion is as brave as a prince, and a prince exceeding that is a prodigal. There is no gallantry beyond what is fit and decent. Unseemly bounty is waste both of wealth and wit. He that, when he should not, spends too much, shall, when he would not, have too little to spend. It was a witty reason of Diogenes when he asked but a halfpenny of the thrifty man and a pound of the prodigal:—the first, he said might give him often; but the other, ere long, would have nothing to give. To spare in weighty causes is the worst and most unhappy part of thrift that can be. Liberality, like a warm shower, mollifies the hardest earth and prepares it for fertility; but he that is penurious turns his friends into enemies, and hardens that which himself desires to find pliant. Who can expect to reap that never sowed his seed; or, in a drought, who will not expect to find his harvest poor? Doubtless there is not any worse husbandry than the being too near, and sordidly miserable; and there is no man but at the long run loses by it. Nor, on the other hand, can we find that to spend vainly, even with a plentiful fortune, hath any warrant either from prudence or religion. 'Tis a kind of scandal to the wise to see a riotous waste made of wealth that might be employed to more precious uses. If we have a superfluity, the poor have an interest in it: but surely none is due to either waste or wantonness. Wealth foolishly consumed is wine upon the pavement dasht, which was by Providence destined to have cheered the heart. If the thing had been condemnable, or his intention warrantable, it was not phrased amiss when Judas grumbled,—'To what purpose is this waste?' Certainly, here is a better use to be made of our talents than to cast them away in waste. If God gave us them not to lie idly by us, we cannot think he should be pleased, when either loosely we consume them or lewdly we mispend them. 'Tis the improving, not the wasting or hoarding, that the master does commend; and this should be with moderation; else the gloss and grace of all is dull."—*Owen Feltham's Resolves.*

*** The Office of the Society for the Diffusion of Useful Knowledge is at 59, Lincoln's Inn Fields.

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